REMARKS

Applicant respectfully thanks the Examiner for granting an interview with Applicant's attorney, David Rosenbaum, and Christopher E. Banas, President of the assignee, Advanced Bio Prosthetic Surfaces, on October 4, 2002 during which the above-identified patent application was discussed.

Summary of Amendments

A number of amendments made herein are in accordance with suggestions provided by the Examiner in the outstanding Office Action (Paper No. 4), and do not change the claims substantively or add new matter. Additionally, the amendments to the specification are fully supported and add no new matter. Specifically, the addition of "interstices 32" in the paragraph beginning on page 8, line 27 is clearly provided for in Fig. 5.

With respect to the claims the following summarizes the antecedent support for amendments to the claims:

- Amended claim 8: "traversing the length of" has been substituted for "disposed in" and referring to the relationship between the discontinuous interior cavities in the plurality of structural elements. Fig. 7 shows internal cavity 37 traversing the length of tubular structural element 31.
- Claim 1 has been cancelled and is replaced by new claim 15 which differs from originally filed Claim 1 as follows:
    - added "plurality of exterior surfaces" to structural body;
    - replaced the "at least one of a plurality of openings" to "at least two of a plurality of openings;" and
    - replaced "external to the structural body" with "at least two of the plurality of exterior surfaces."

  Antecedent support for Claim 15 is found in Fig. 3 which shows multiple openings, including at least two, one communicating with the internal cavity 12 and the abluminal surface and another communicating with the internal cavity 12 and the luminal surface. Also, see page 7, lines 9-10, which states

that openings "may be disposed on only the luminal surface 26 or only on the abluminal surface 28 of the tubular body 20, or both." Added dependent claims 17-20 add the limitation "a degradable plug residing within the plurality of openings." The degradable plug is supported by the specification and in particular on page 8, lines 17-22. Added independent claims 16 and 21, and claims 12-14 and 22-25 which depend therefrom, are also fully supported by the specification. With respect to claim 16, and dependent claims 12-14, page 11, lines 2-13 describe a fabrication method for forming the claimed structure that includes a pair of layers of structural material and etching to remove sacrificial material therebetween in order to form internal cavities or void space. With respect to claim 21, and dependent claims 22-25, the structure is generally described on page 5, lines 7-18. Additionally, it is generally known in the art of endoluminal stents that the areas of relatively lower strain include the structural members that do not form the hinge or connecting regions.

All amended and added claims are fully supported by the specification. Accordingly, no new matter is being added.

Drawings

The rejection of claims 3-7, and 9-14 under 35 USC §112, second paragraph, should be withdrawn since the claims have been amended and the basis for the rejection has been removed.

The rejection of claim 1-14 under 35 USC §102(e) and §103(a) over Brown et al (US Pat No. 6,071,305) and Brown et al in view of Alt (US Pat. No. 6,099,561) or Reed *et al.* (US Pat. No. 6,197,013) should be withdrawn based on the following. The pending claims after amendment include either a limitation that the interior cavity communicates with more than one surface through at least two of a plurality of openings, that the openings are formed only on regions of relatively lower strain, or that the internal cavity is discontinuous along the length of the structural members. The prior art fails to disclose or teach an implantable body or stent that includes any of these limitations and, therefore, this rejection is no longer appropriate and should be withdrawn.

The Examiner has cited and relied upon Brown *et al.* as disclosing the apparatus of the present invention. However, Brown *et al.* fails to disclose or teach any of the above-mentioned limitations and fails to anticipate or render obvious the present pending claims. The Examiner incorrectly suggests that Brown *et al.* teaches that the interior cavities may be discontinuous (See Page 5 of Paper No. 4). The relevant sections of Brown *et al.* cited by the Examiner in support of discontinuous interior cavities, in fact, show a stent with discontinuous laser-cut grooves along the structural elements (See Fig. 18) and discuss that a concave groove "need not extend the entire length of the elongated or tubular member" (Col. 5, lines 50-55), explaining that the groove is a cavity and can be other configurations. The other cited passage, Col. 6, lines 16-21, fails to discuss the characteristics of the groove and, instead, discusses the arrangement of holes. As much as Brown *et al.* may suggest that an interior cavity is interchangeable with a groove, that suggestion is incorrect. An interior cavity cannot be laser-cut in the manner described for the discontinuous grooves taught on Col. 12, lines 20-32. Interior cavities, as depicted in the Figures of the present invention, are large interior chambers that are bounded on all surfaces by the structural member. The plurality of openings are the only means for communicating between the interior chamber and external the structural member. In contradistinction, a groove is a long furrow-like opening that is bounded by the structural body on only three surfaces thereof, *i.e.*, the bottom and lateral sides of the groove and is not enclosed by the structural body like the interior cavities of the present invention. Thus, because the interior cavities are bounded entirely by the structural body, it is not possible to laser-cut the interior cavities without ablating the enclosing surfaces of the structural body. Unlike the interior cavity of the present invention, the groove has a continuous elongated opening on its unbounded surface. Brown *et al.* also recognized the distinction between a cavity and a groove. In Figs. 3 and 4, Brown *et al.* depict that the biologically active agent 23 is delivered through a slit opening 22 from the ***cavity*** 20 and in Fig. 6 the agent 23 is delivered through openings or holes 28 from the ***cavity*** 20. In contrast to Brown's cavity, however, in the discussion of Fig. 14 of a discontinuous groove there is no mention of any holes or openings, which, of course would not be needed for a groove as the opening of a groove is an inherent part of the groove itself. See, Col. 12, lines 21-32. One of ordinary skill would understand that a teaching of a post-fabrication method of forming grooves, *e.g.*, laser-cutting, may show how to incorporate discontinuous grooves onto a stent structure, but

fails to teach discontinuous interior cavities of methods of making discontinuous interior cavities.

Additionally, Brown *et al.* discloses a device for directional drug delivery and does not disclose multi-directional drug delivery as in the claimed invention. All the figures and discussion of the embodiments represented by each of the figures show or describe a device that can deliver drugs from a cavity or groove to one general direction, either luminal or abluminal. This is particularly explained on Col. 8, lines 38-60. The embodiments that include multi-directional delivery require delivery of two different biologically active agents 23, 25 to each respective direction from their respectively defined cavity or area of the cavity. See Figs. 9 and 10. This is not a suggestive of a single interior cavity having openings in multiple surfaces of the device.

Furthermore, there is nothing disclosed in Brown *et al.* that indicates any reason for placing the holes or openings on any particular area or portion of the structural members. The claimed invention including openings on areas of relatively lower strain provide a novel implantable body or endoluminal stent that limits compromise of the strength and durability of the stent, while maintaining the ability to deliver drugs from an interior cavity by specifically placing the holes or openings throughout the structural elements.

The other cited patents, Alt and Reed do not disclose a drug delivery element of a stent and do not make up for the deficiencies present in Brown *et al.* as discussed above. In addition, with respect to the obviousness rejection, there is no suggestion or motivation in the cited art for combining a vapor deposition method with the teachings of Brown *et al.* Brown *et al.* only discusses tubular structures that are basically an extruded wire or a pre-fabricated stent structure, which fails to include any discussion of vapor deposition and the extruded wire is not practical for fabrication by vapor deposition. Brown *et al.* focuses on using post-fabrication modifications to form grooves using a laser for cutting such grooves, unlike aspects of the present invention where interior cavities are formed using vapor deposition. The rejection of claims based on the combination of Brown *et al.* with either Alt or Reed is improper as the Examiner has failed to provide a motivation to combine the prior art.

Accordingly, Brown *et al.*, either alone or in combination with either Alt or Reed, fails to anticipate or render obvious the claimed invention and, therefore, the rejections under sections 102 and 103 should be withdrawn.

SUMMARY

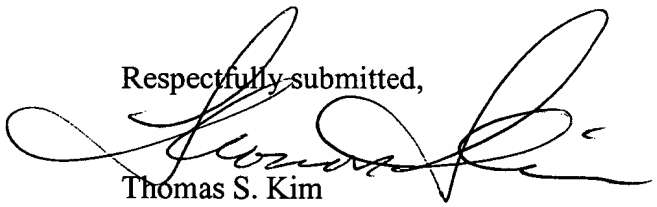
According to the amendments and arguments presented above, the Applicant respectfully submits that the cited references fail to anticipate or render obvious the present invention and all pending claims 2-10 and 12-25 are in allowable form and allowance is respectfully requested.

This Response is being timely filed as it is being filed along with a three-month extension and appropriate fees.

Should the Examiner require any further information or wish to discuss any aspect of this Response, the Examiner is encouraged to telephone the undersigned at the telephone number set forth below.

November 18, 2002

Respectfully submitted,



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MARKED UP VERSION OF CLAIMS SHOWING AMENDMENTS

In the Specification:

Please replace the paragraph beginning on page 8, line 27 with the following paragraph.

Turning to Figures 5-7 there is illustrated an alternative embodiment of the inventive endoluminal stent fabricated from a plurality of tubular structural elements 31 formed into a tubular stent and having a desired geometry. It will be appreciated that the generally hexagonal cell geometric pattern defining a plurality of interstices 32 as illustrated in Figure 5 is merely exemplary and a myriad of different geometries of different geometric complexities are contemplated by the invention. Each of the tubular structural elements 31 has a central lumen 37 that forms the internal cavity within each structural element 31. A plurality of separation member 38 may be provided to subdivide the internal cavity 37 into a plurality of discontinuous internal cavities 37. Each of the tubular structural elements 31 has a plurality of openings 36 which communicate between the internal cavity 37 and one or both of a luminal surface 33 or an abluminal surface 35 of each of the plurality of tubular structural elements 31. The tubular structural elements 31 may assume any transverse cross-sectional configuration having a central lumen.

Please replace the paragraph beginning on page 10, line 8 with the following paragraph.

Like the above-described embodiments, the structural body 42 has at least one of a plurality of internal cavities 47, each of which carry a bioactive agent [47]49, and a plurality of openings 44 which pass from at least one upper 46, lower 48 or lateral 45 surface of the structural body 42, through the Z-axis thickness of the body and communicate with the at least one of a plurality of internal cavities 47 in the structural body 42. Where a plurality of internal cavities 47 are provided within the structural body 42, a plurality of bioactive agents 49 may be loaded into the structural body 42 with one or more bioactive agents 49 being loaded into each of the plurality of internal cavities 47.

In the Abstract:

Page 16, lines 2-7, please replace the Abstract in its entirety with the following new paragraph:

The disclosure of the invention provides [present invention consists of]an implantable structural element for *in vivo* delivery of bioactive agents to a situs in a body. The implantable structural element may be configured as an implantable prosthesis, such as an endoluminal stent, cardiac valve, osteal implant or the like, which serves a dual function of being prosthetic and a carrier for a bioactive agent. Alternatively, the implantable structural element may simply be an implantable article that serves the single function of acting as a time-release carrier for the bioactive agent.

In the claims:

2. (Amended) The implantable body according to Claim 15, wherein the structural body further comprises an endoluminal stent being composed of a plurality of interconnected individual structural elements, each of the plurality of interconnected individual structural elements having the at least one internal cavity, the at least one of a plurality of openings and the at least one bioactive agent therein.

3. (Amended) The implantable body according to Claim 15, wherein the structural body further comprises a material selected from the group consisting of titanium, vanadium, aluminum, nickel, tantalum, zirconium, chromium, silver, gold, silicon, magnesium, niobium, scandium, platinum, cobalt, palladium, manganese, molybdenum and alloys thereof, [such as]including zirconium-titanium-tantalum alloys, nitinol, and stainless steel.

4. (Amended) The implantable body according to Claim 15, wherein the bioactive agent further comprises a pharmacologically active agent selected from the group consisting of antibiotic drugs, antiviral drugs, neoplastic agents, steroids, fibronectin, anti-clotting drugs, anti-platelet function drugs, drugs which prevent smooth muscle cell growth on inner surface wall of vessel, heparin, heparin fragments, aspirin, coumadin, tissue plasminogen activator [(TPA)], urokinase, hirudin, streptokinase, antiproliferatives, [(]methotrexate, cisplatin, fluorouracil,

[Adriamycin)] adriamycin, antioxidants, [(]ascorbic acid, beta carotene, vitamin E[)], antimetabolites, thromboxane inhibitors, non-steroidal and steroidal anti-inflammatory drugs, immunosuppresents, such as rapomycin, beta and calcium channel blockers, genetic materials including DNA and RNA fragments, complete expression genes, antibodies, lymphokines, growth factors, [(]vascular endothelial growth factor [(VEGF)] and fibroblast growth factor [(FGF))], prostaglandins, leukotrienes, laminin, elastin, collagen, nitric oxide [(NO)], and integrins.

5. (Amended) An endoluminal stent, comprising:

a tubular member having a three-dimensional conformation and a central lumen passing longitudinally through the tubular member and open at opposing ends of the tubular member,

a luminal surface and an abluminal surface and a wall thickness defined therebetween,

[at least one]a plurality of independent internal [cavity]cavities residing within the wall thickness in at least some portions of the tubular member,

a plurality of openings communicating between the [at least one]plurality of independent internal [cavity]cavities and at least one of the luminal surface, abluminal surface, a proximal end and a distal end of the tubular member,

and at least one bioactive agent disposed in the at least one internal cavity.

6. (Amended) The [implantable body]endoluminal stent according to Claim 5, wherein the [structural body]tubular member further comprises a material selected from the group consisting of titanium, vanadium, aluminum, nickel, tantalum, zirconium, chromium, silver, gold, silicon, magnesium, niobium, scandium, platinum, cobalt, palladium, manganese, molybdenum and alloys thereof, [such as]including zirconium-titanium-tantalum alloys, nitinol, and stainless steel.

7. (Amended) The [implantable body]endoluminal stent according to Claim 6, wherein the bioactive agent further comprises a pharmacologically active agent selected from the

group consisting of antibiotic drugs, antiviral drugs, neoplastic agents, steroids, fibronectin, anti-clotting drugs, anti-platelet function drugs, drugs which prevent smooth muscle cell growth on inner surface wall of vessel, heparin, heparin fragments, aspirin, coumadin, tissue plasminogen activator [(TPA)], urokinase, hirudin, streptokinase, antiproliferatives, [()methotrexate, cisplatin, fluorouracil, [Adriamycin)] adriamycin, antioxidants, [()ascorbic acid, beta carotene, vitamin E[)], antimetabolites, thromboxane inhibitors, non-steroidal and steroidal anti-inflammatory drugs, immunosuppresents, such as rapomycin, beta and calcium channel blockers, genetic materials including DNA and RNA fragments, complete expression genes, antibodies, lymphokines, growth factors, [()vascular endothelial growth factor [(VEGF)] and fibroblast growth factor [(FGF))], prostaglandins, leukotrienes, laminin, elastin, collagen, nitric oxide [(NO)], and integrins.

8. (Amended) An endoluminal stent, comprising:

a cylindrical member comprised of a plurality of structural elements defining walls of the cylindrical member,

a plurality of discontinuous interior cavities traversing the length of [disposed in] at least some of the plurality of structural elements, [and]

a plurality of openings communicating between each of the plurality of discontinuous interior cavities and external the stent,

and at least one bioactive agent disposed within the plurality of discontinuous interior cavities.

9. (Amended) The [implantable body]endoluminal stent according to Claim 8, wherein the [structural body]cylindrical member further comprises a material selected from the group consisting of titanium, vanadium, aluminum, nickel, tantalum, zirconium, chromium, silver, gold, silicon, magnesium, niobium, scandium, platinum, cobalt, palladium, manganese, molybdenum and alloys thereof, [such as]including zirconium-titanium-tantalum alloys, nitinol, and stainless steel.

10. (Amended) The [implantable body]endoluminal stent according to Claim 9, wherein the bioactive agent further comprises a pharmacologically active agent selected from the group consisting of antibiotic drugs, antiviral drugs, neoplastic agents, steroids, fibronectin, anti-clotting drugs, anti-platelet function drugs, drugs which prevent smooth muscle cell growth on inner surface wall of vessel, heparin, heparin fragments, aspirin, coumadin, tissue plasminogen activator [(TPA)], urokinase, hirudin, streptokinase, antiproliferatives, [(]methotrexate, cisplatin, fluorouracil, [Adriamycin)] adriamycin, antioxidants, [(]ascorbic acid, beta carotene, vitamin E[)], antimetabolites, thromboxane inhibitors, non-steroidal and steroidal anti-inflammatory drugs, immunosuppresents, such as rapomycin, beta and calcium channel blockers, genetic materials including DNA and RNA fragments, complete expression genes, antibodies, lymphokines, growth factors, [(]vascular endothelial growth factor [(VEGF)] and fibroblast growth factor [(FGF))], prostaglandins, leukotrienes, laminin, elastin, collagen, nitric oxide [(NO)], and integrins.

12. (Amended) The endoluminal stent according to Claim [11]16, wherein the endoluminal stent is fabricated by vapor deposition of at least one metal.

13. (Amended) The [implantable body]endoluminal stent according to Claim 12, wherein the at least one metal is selected the group consisting of titanium, vanadium, aluminum, nickel, tantalum, zirconium, chromium, silver, gold, silicon, magnesium, niobium, scandium, platinum, cobalt, palladium, manganese, molybdenum and alloys thereof, [such as]including zirconium-titanium-tantalum alloys, nitinol, and stainless steel.

14. (Amended) The [implantable body]endoluminal stent according to Claim [11]16, wherein the bioactive agent further comprises a pharmacologically active agent selected from the group consisting of antibiotic drugs, antiviral drugs, neoplastic agents, steroids, fibronectin, anti-clotting drugs, anti-platelet function drugs, drugs which prevent smooth muscle cell growth on inner surface wall of vessel, heparin, heparin fragments, aspirin, coumadin, tissue plasminogen activator [(TPA)], urokinase, hirudin, streptokinase, antiproliferatives, [(]methotrexate, cisplatin, fluorouracil, [Adriamycin)] adriamycin, antioxidants, [(]ascorbic acid, beta carotene, vitamin

E[)], antimetabolites, thromboxane inhibitors, non-steroidal and steroidal anti-inflammatory drugs, immunosuppresents, such as rapomycin, beta and calcium channel blockers, genetic materials including DNA and RNA fragments, complete expression genes, antibodies, lymphokines, growth factors, [(]vascular endothelial growth factor [(VEGF)] and fibroblast growth factor [(FGF))], prostaglandins, leukotrienes, laminin, elastin, collagen, nitric oxide [(NO)], and integrins.

--15. (New) An implantable body, comprising:

a structural body having a three-dimensional conformation, a plurality of exterior surfaces and a thickness thereto, at least one internal cavity residing within the thickness of the structural body,

at least two of a plurality of openings communicating between the at least one internal cavity and at least two of the plurality of exterior surfaces,

at least one bioactive agent disposed in the at least one internal cavity, the at least one bioactive agent being releasable from the at least one internal cavity through the at least two of a plurality of openings upon implantation of the structural body into a body in need thereof.

16. (New) An endoluminal stent for delivering a bioactive agent to a situs in a body, comprising:

a plurality of interconnected structural elements forming a radially expandable generally tubular member, at least some of the plurality of structural elements having a wall thickness comprising a first layer and a second layer covering the first layer,

a void space intermediate the first and second layers and enclosed therebetween,

a plurality of pores passing through at least one of the first and second layers communicating with the void space and

at least one bioactive agent retained within the void space and elutable through the plurality of pores.

17. (New) The implantable body according to claim 15, further comprising a degradable plug disposed within at least some of the plurality of openings to prohibit release of the at least one bioactive agent until degradation of the degradable plug.

18. (New) The endoluminal stent according to claim 5, further comprising a degradable plug disposed within at least some the plurality of openings to prohibit release of the at least one bioactive agent until degradation of the degradable plug.

19. (New) The endoluminal stent according to claim 8, further comprising a degradable plug disposed within at least some the plurality of openings to prohibit release of the at least one bioactive agent until degradation of the degradable plug.

20. (New) The endoluminal stent according to claim 16, further comprising a degradable plug disposed within at least some the plurality of pores to prohibit release of the at least one bioactive agent until degradation of the degradable plug.

21. (New) An impantable medical device comprising:

a geometrically deformable structural body having a three-dimensional conformation and a thickness thereto, the structural body having a first and second structural region, one of the first and second structural region being adapted to undergo relatively lower strain during geometric deformation of the structural body,

at least one internal cavity residing within the thickness of the structural body,

at least one of a plurality of openings communicating between the at least one internal cavity and external to the structural body, the at least one of a plurality of openings positioned along an exterior area of one of the first or second structural region that undergo relatively lower strain during geometric deformation of the implantable stent device, and

at least one bioactive agent disposed in the at least one internal cavity, the at least one bioactive agent capable of being released from within the at least one internal cavity through the at least one of a plurality of openings, upon implantation of the structural body into a body in need thereof.

22. (New) The implantable medical device according to claim 21, wherein the geometrically deformable structural body further comprises a plurality of interconnected individual structural elements, each of the plurality of interconnected individual structural elements having the at least one internal cavity, the at least one of a plurality of openings and the at least one bioactive agent therein.

23. (New) The implantable medical device according to claim 21, wherein the geometrically deformable structural body further comprises a material selected from the group consisting of titanium, vanadium, aluminum, nickel, tantalum, zirconium, chromium, silver, gold, silicon, magnesium, niobium, scandium, platinum, cobalt, palladium, manganese, molybdenum and alloys thereof, such as zirconium-titanium-tantalum alloys, nitinol, and stainless steel.

24. (New) The implantable medical device according to claim 21, wherein the bioactive agent further comprises a pharmacologically active agent selected from the group of antibiotic drugs, antiviral drugs, neoplastic agents, steroids, fibronectin, anti-clotting drugs, anti-platelet function drugs, drugs which prevent smooth muscle cell growth on inner surface wall of vessel, heparin, heparin fragments, aspirin, coumadin, tissue plasminogen activator [(TPA)], urokinase, hirudin, streptokinase, antiproliferatives, [()]methotrexate, cisplatin, fluorouracil, [Adriamycin)] adriamycin, antioxidants, [()]ascorbic acid, beta carotene, vitamin E[)], antimetabolites, thromboxane inhibitors, non-steroidal and steroidal anti-inflammatory drugs, immunosuppresents, such as rapomycin, beta and calcium channel blockers, genetic materials including DNA and RNA fragments, complete expression genes, antibodies, lymphokines, growth factors, [()]vascular endothelial growth factor [(VEGF)] and fibroblast growth factor [(FGF))], prostaglandins, leukotrienes, laminin, elastin, collagen, nitric oxide [(NO)], and integrins.

25. (New) The implantable medical device according to claim 21, further comprising a degradable plug residing within the at least one of a plurality of openings to prohibit release of the at least one bioactive agent until the degradation of the degradable plug.--